A Critical Anatomical Study of Kloma According to Modern Science

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Abstract

Kloma is mentioned in Ayurvedic classics as an internal organ, a *Kapha-sthana*, and one of the *Mulasthana of Udakavaha Srotas*, yet its exact anatomical identity remains controversial. The present review critically analyses classical descriptions of *Kloma* and correlates them with modern anatomical structures such as pancreas, gall bladder, mediastinum and thoracic organs, lungs, and suprarenal glands.[1,6–10] Relevant references from Bṛhattrayī and later saṃhitās and commentaries were compiled and compared with recent conceptual and clinical studies. On critical appraisal, no single modern organ fulfills all classical criteria of Kloma; however, pancreas and mediastinal–pleuropulmonary structures show the closest composite correlation from the standpoints of *Udakavaha Srotas, Kapha-sthana, and viddha-lakṣaṇa*.

Keywords: *Kloma; Udakavaha Srotas; Kapha-sthāna; Pancreas; Mediastinum; Suprarenal gland.*

1. Introduction

Ayurveda describes a number of internal organs *(Antar-Avyavas)* whose exact correlation with modern anatomy is debated; *Kloma* is among the most controversial of these. *Kloma* is described as an internal organ belonging to the Kapha group and as one of the roots *(Mula)* of *Udakavaha Srotas*, whose other root is *Talu*. Injury to *Udakavaha Srotas* is said to produce *Pipāsā* (intractable thirst) and *Sadyomaraṇa* (rapid death), underscoring the vital role of *Kloma* in water homeostasis. At the same time, classical statements about its site—near *Hṛdaya, in the Koṣṭha,* and in relation to *Sandhis of Hṛdaya*—have led to divergent opinions regarding its topography.[1,2–4,11]

In modern anatomical correlation, *Kloma* has been variously compared with gall bladder (*Pittaśaya),* pancreas (*Agnyaśaya),* right lung, mediastinum, mesentery, lymphatic system, and suprarenal glands.[1,6–9,14] Recent conceptual and analytical studies attempt to re-evaluate these identifications using pathophysiological models such as acute pancreatitis and adrenal crisis, as well as broader systems-biology perspectives on fluid balance.[7–10,13,15,16] However, a critical, consolidated anatomical appraisal suitable for contemporary Ayurvedic research writing remains needed.

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Aims:

(1) Review and synthesize classical descriptions of Kloma,

(2) Examine major modern anatomical correlations and their evidence.

(3) Critically assess which correlations best satisfy the classical criteria.

2. Materials and Methods

Classical data were collected from Charaka Saṃhitā, Suśruta Saṃhitā, Aṣṭāṅga Hṛdaya and their principal commentaries, with emphasis on references describing *Kloma as Kapha-sthāna, mūlasthāna of Udakavaha Srotas,* and its location in relation to *Hṛdaya* and *Koṣṭha.[*2–4,11] Relevant *Shlokas* were identified from *Śhārīrasthāna and Vimānasthāna* and cross-checked across different editions and commentaries for consistency.[2–5,11]

Modern anatomical and conceptual correlations were identified through search of indexed Ayurvedic and biomedical journals using the keywords *"Kloma", "Udakavaha Srotas",* "pancreas", "suprarenal gland", "mediastinum", and "pleura".[6–10,12–16]

3. Classical description of Kloma

In Suśruta Saṃhitā, Udakavaha Srotas are said to be two, with roots in Talū and Kloma; their injury produces intense thirst and *Sadyomaraṇa*. Charaka also identifies *Talū* and *Kloma* as the mūla of *Udakavaha Srotas* and includes *Kloma among the Koṣṭhāṅgas*. Aṣṭāṅga Hṛdaya further supports its status as an abdominal visceral organ (koṣṭhāṅga) with Kapha predominance.

Suśruta describes the relative position of viscera as: below and to the left of the heart are *Pleeha and Phupphusa;* to the right are *Yakṛt and Kloma*, suggesting a structure on the right side in close relation to liver and thoracic organs. In another context, *Kloma is* mentioned among *Sandhis* associated with *Hṛdaya*, implying junctional or regional features around the heart. Taken together, these statements place *Kloma* in the thoraco-abdominal region, near *Hṛdaya, Yakṛt and Phupphusa*, and functionally link it to water regulation and *Kapha.[*3–5,11]

Functional attributes: Udakavaha Srotas and thirst

Udakavaha Srotas is responsible for transport and regulation of water (udaka) throughout the body. Its two roots, *Talū and Kloma,* have been interpreted as alarm or signal stations indicating systemic water deficit. *Viddha-lakṣaṇa* of *Udakavaha Srotas—pipāsā* and *sadyomaraṇa*—suggest that severe injury to *Kloma* produces profound thirst, third-space fluid loss, and potentially fatal shock.

Modern authors have explored this description using clinical models such as acute pancreatitis due to blunt abdominal trauma, where patients present with severe epigastric pain radiating to the back, abdominal distension, massive third-space fluid loss, intense thirst and a high mortality if untreated. These features closely parallel Udakavaha Srotas viddha-lakṣaṇa, supporting a pancreatic correlation.

4. Major modern anatomical proposals

i. Kloma as pancreas

Verma analysed Udakavaha Srotas viddha-lakṣaṇa in the context of blunt pancreatic trauma and acute pancreatitis and concluded that Kloma may be compared to the pancreas. The pancreas lies retroperitoneally in the upper abdomen, closely related to liver, duodenum and spleen, and is supplied and drained by major vessels, making trauma to it highly

morbid and sometimes fatal.

However, classical references place Kloma close to the right side of Hṛdaya and Yakṛt, and as a Kapha-sthāna, suggesting a more thoracic association than the purely abdominal, retroperitoneal position of the pancreas. Moreover, pancreas is generally associated with Agni and Pitta functions as Agnyaśaya, whereas Kloma is placed in the Kapha group of organs.

ii. Kloma as gall bladder (Pittaśaya)

Some earlier authors equated Kloma with gall bladder, considering its proximity to Yakṛt and right hypochondrial location. Classical statements that pair Kloma with Yakṛt have been used to support this view. A conceptual review noted that the hepatobiliary region is a plausible topographic candidate for Kloma.

Nonetheless, the gall bladder's primary role is bile storage and concentration; it is not central to systemic water balance or thirst regulation. It is also more naturally a Pitta-dominant organ than a Kapha-sthāna. Therefore, while gall bladder fits certain locational clues, it does not adequately explain Udakavaha Srotas mūla or the strong link with pipāsā and sadyomaraṇa.

iii. Kloma as mediastinum or thoracic complex

Based on Suśruta's description around Hṛdaya and the mention of Kloma among Sandhis related to Hṛdaya, some scholars propose that Kloma denotes a region of the mediastinum rather than a single solid organ. In this view, Kloma corresponds to a thoracic complex that includes pericardium, major vessels, lymphatics and adjacent pulmonary tissue, forming part of a Kapha-rich thoracic environment.

Such an interpretation explains the proximity to Hṛdaya and Phupphusa and the Kapha-sthāna status of the region. It also resonates with modern knowledge that intrathoracic structures, central circulation and neurohumoral mechanisms contribute to baroreceptor-mediated thirst and fluid regulation. However, mediastinum is a region and not a discrete organ, complicating one-to-one organ identification, and clinical patterns of mediastinal injury do not always mirror the classical Udakavaha Srotas viddha-lakṣaṇa.

iv. Kloma as lung or pleuropulmonary structures

Another hypothesis equates Kloma with the right lung or pleural structures, drawing support from Pāli literature in which "Kilomaka" is described as the covering of flesh, and from interpretations that Suśruta considered Kloma to be a mass on the right of the h

v. Kloma as suprarenal (adrenal) glands

More recent analytical work, including a Paripex article by Meher, compares Kloma to the suprarenal glands, especially the cortex, due to their role in secreting mineralocorticoids such as aldosterone. Loss of aldosterone leads to loss of sodium and water, resulting in dehydration, cramps, thirst and, if uncorrected, death within days—remarkably similar to the description of Udakavaha Srotas injury leading to pipāsā and sadyomaraṇa. The suprarenal glands also have anatomical relations with liver and spleen through their vascular supply and venous drainage, offering some support to classical associations with Yakṛt and Pleeha.

However, they are small retroperitoneal glands located above the kidneys and do not conform well to the description of a large Kapha-sthāna near Hṛdaya, and classical texts never explicitly suggest a bilateral organ for Kloma.

vi. Other proposals: mesentery, lymphatic system and small intestine

Some modern authors, particularly in conceptual web essays, have widened the idea of Kloma to include mesentery and associated lymphatic structures, given their roles in fluid transport from the intestines and potential impact on systemic hydration. The early jejunum is a major site of water absorption, and mesenteric ischaemia can cause severe fluid loss and shock, which may parallel Udakavaha Srotas viddha-lakṣaṇa.

These proposals, while physiologically attractive, lack direct textual support identifying Kloma with mesentery or small intestine, and they do not fully explain the proximity to Hṛdaya and right thoracic structures emphasised in Suśruta Saṃhitā.

5. Critical comparison of competing hypothesis

When evaluated against the composite criteria derived from classical texts—Kapha predominance and water regulation, role as mūla of Udakavaha Srotas, proximity to Hṛdaya and Koṣṭha, association with Yakṛt and Phupphusa, and fatal outcome on injury—no single modern organ satisfies all requirements.[2–5,7–10,13–16]

The pancreatic hypothesis is strongly supported by clinical parallels between Udakavaha Srotas viddha-lakṣaṇa and acute pancreatitis or pancreatic trauma: intense thirst, massive third-space fluid loss, and high mortality in the absence of prompt treatment. Pancreas also has Kapha-like functions through its exocrine secretions and endocrine role in glucose metabolism, where insulin deficiency causes polydipsia, suggesting a link to thirst.

The adrenal hypothesis provides a robust endocrine explanation for thirst and fatal dehydration via aldosterone deficiency and adrenal crisis, closely mirroring the time frame of sadyomaraṇa described in classical texts. Yet its small bilateral anatomy and retroperitoneal location do not match the gross thoraco-abdominal placement of Kloma suggested by Suśruta.

Gall bladder, lung and pure mediastinal interpretations each satisfy parts of the puzzle—topography, Kapha-rich environment, or association with chest symptoms—but are weaker in explaining the central role of Kloma in Udakavaha Srotas and thirst. Mesentery and small intestine proposals illuminate aspects of water absorption and transport but lack direct classical naming and do not fit the right-thoracic orientation.

6. Integrative functional concept of Kloma

Given these limitations, several modern scholars advocate viewing Kloma as a functional anatomical concept rather than a single organ. In this integrative model, Kloma denotes a thoraco-abdominal axis of structures involved in systemic water regulation and Kapha-related homeostasis, including Talū and central thirst mechanisms, pancreas and upper intestinal mesentery, mediastinal lymphatics and pleura, and neuroendocrine organs such as suprarenal glands.

Such a systems-level interpretation is consistent with current understanding that fluid and electrolyte balance is governed by coordinated action of hypothalamus, pituitary, heart and great vessels, kidneys, adrenals, gastrointestinal tract, and intravascular and interstitial compartments. Kloma, in this sense, functions as an Ayurvedic construct capturing the integrated behaviour of these organs, particularly those in the right thoraco-abdominal quadrant adjacent to Hṛdaya and Yakṛt.[2–4,12]

7. Implications for Rachana Śharīra and clinical practice

For Rachana Śarīra, it is pedagogically sound to present Kloma with its full spectrum of classical references and modern hypotheses, rather than enforcing a single rigid correlation. Students should be encouraged to critically

appraise how different organs meet or fail classical criteria, and to appreciate the interpretive nature of anatomical mapping between Ayurvedic and modern frameworks.

Clinically, overly narrow identification of Kloma with one structure, such as pancreas alone, risks conceptual reductionism. Instead, discussions of Kloma-vikāra may refer to clinical entities showing severe disturbances of body water and Kapha-related physiology—acute pancreatitis, severe adrenal insufficiency, major mediastinal pathology with fluid shifts—while clearly acknowledging that these are models illustrating aspects of Kloma rather than exact equivalents.

8. Conclusion

The present critical anatomical review of Kloma suggests that the classical description does not map precisely onto any single modern organ. Among currently proposed correlates, pancreas and suprarenal glands best explain the viddha-lakṣaṇa of Udakavaha Srotas, while mediastinal and pleuropulmonary complexes better satisfy Kapha-sthāna and topographical clues near Hṛdaya and Yakṛt.[2–7,9,10,14–16] Gall bladder, mesentery and small intestinal segments provide additional, but partial, support.

In light of available evidence, Kloma is most reasonably understood as a functionally oriented organ concept representing a right thoraco-abdominal complex concerned with systemic water regulation and Kapha homeostasis, rather than a single discrete anatomical structure. Future work combining detailed re-examination of classical passages, imaging-based anatomical studies, and clinical correlation of thirst- and fluid-related pathologies may further refine this understanding and strengthen the bridge between Ayurvedic Śarīra and modern anatomy.[1–3,6–8,10,14–16]

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